



# 5B Series 8-Channel Backplanes

## 5B08/5B08-MUX

### FEATURES

8-Channel, Industry Standard 5B Series Compatibility

Two Backplane Selections

5B08: Eight Independent I/O Channels

5B08-MUX: Eight I/O Channels Multiplexed onto One Bus

Mix and Match 5B Series I/O Module Capability

Thermocouple, RTD, mV, V, F/V, mA, Strain Gage

-25°C to +85°C Temperature Range

1500 V rms Chan/Chan and Input/Output Isolation

FM Approved

Approved for Use in Class I, Division 1 & 2,

Groups A, B, C and D Locations

CE Approved

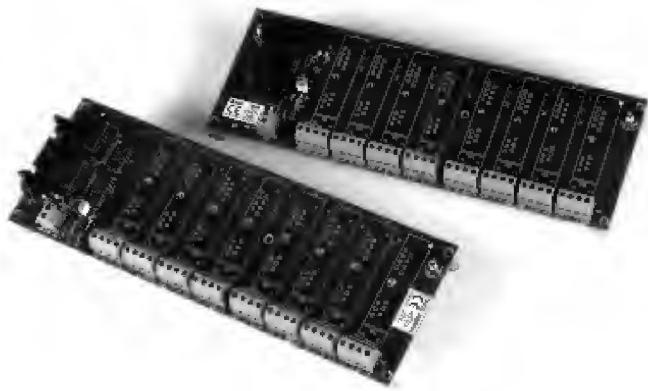
EMC Directive In Heavy Industrial Applications

### APPLICATIONS

Front-End Data Acquisition Systems

Process Control and Monitoring

Product Test



### GENERAL DESCRIPTION

The 5B08 and 5B08-MUX backplanes accept up to eight 5B Series input/output modules, providing direct screw terminal interfacing to sensors and transducers, as well as a 26-pin connector I/O interface to a measurement and control system (refer to Figures 2 and 3 for functional block diagrams). Model 5B08 backplane I/O signals are independently available, while Model 5B08-MUX I/O signals are controlled via an on-board multiplexer providing a bus for input signals and a separate bus for output signals. 5B Series modules can be mixed or matched and may be changed without disturbing field wiring. Each channel has a cold junction temperature sensor (Model AC1361) to accommodate thermocouple modules (5B37 or 5B47). Both backplanes require an external +5 V dc regulated power supply. Reverse power supply protection is provided as well as a replaceable 4-ampere fuse and a power ON green LED indicator.

### 5B08 SYSTEM CONNECTORS

Signal connections between the 5B08 and the associated measurement and control system are made with two identical 26-pin connectors (P1 and P2), similar to the 16-channel model 5B01 backplane. Reference to these connectors is electrically identical and may be useful if a 5B08 is used for both analog input and analog output and the data acquisition system has separate input or output connectors. Figure 1 illustrates the pin assignments for P1 and P2.

CH 0	1	○	○	2	CH 8
COM	3	○	○	4	CH 9
CH 1	5	○	○	6	COM
CH 2	7	○	○	8	CH 10
COM	9	○	○	10	CH 11
CH 3	11	○	○	12	COM
CH 4	13	○	○	14	CH 12
COM	15	○	○	16	CH 13
CH 5	17	○	○	18	COM
CH 6	19	○	○	20	CH 14
COM	21	○	○	22	CH 15
CH 7	23	○	○	24	COM
SENSE	25	○	○	26	NC

BOTTOM VIEW

Figure 1. 5B08 System Connector Pinout

REV. 0

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.  
Tel: 617/329-4700      World Wide Web Site: <http://www.analog.com>  
Fax: 617/326-8703      © Analog Devices, Inc., 1997

# 5B08/5B08-MUX—SPECIFICATIONS

(typical @ +25°C and +5 V dc unless otherwise noted)

Model	5B08	5B08-MUX
CHANNELS	8	*
DIMENSION—WITH 5B SERIES MODULES	3.5" x 10.0" x 3.2" (88.9 mm x 254.0 mm x 81.3 mm)	*
WEIGHT	7 oz (200 g)	*
MOUNTING STANDOFFS	5	*
COLD JUNCTION TEMPERATURE SENSORS (Provided On Backplane) Accuracy @ +25°C Over +5°C to +45°C	8, Model AC1361 ±0.25°C (±0.75°C max) ±0.5°C (±0.0125°C/°C)	*
SYSTEM CONNECTOR 26-Pin Male Mating	Amp 746290-6	*
ADDRESS SELECTION INPUTS Max Logic "0" Min Logic "1" Max Logic "1"	N/A N/A N/A	+0.8 V +2.0 V +7.0 V
POWER SUPPLY Voltage: Operating Voltage: Max Safe Limit—With Modules Current—Without Modules Fuse (F1)	+5 V dc ± 5% +6.0 V dc max 13 mA 4 Ampere Littelfuse® Type 252 004	*
TEMPERATURE RANGE Rated Performance Storage Relative Humidity	-25°C to +85°C -40°C to +85°C 0 to 95% @ +60°C Noncondensing	*

\*Specifications same as Model 5B08.

Specifications subject to change without notice.

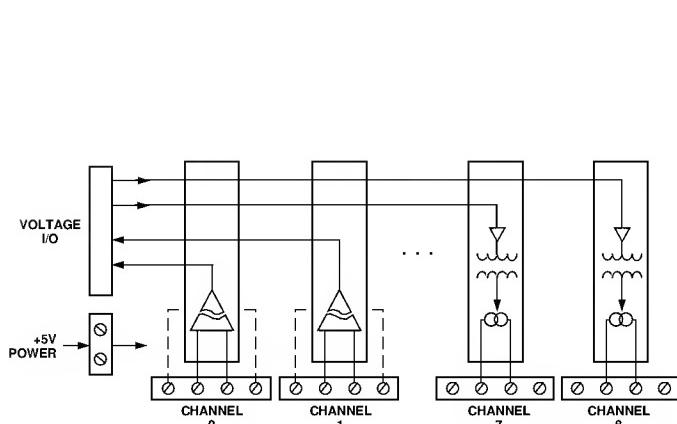


Figure 2. 5B08 Functional Block Diagram

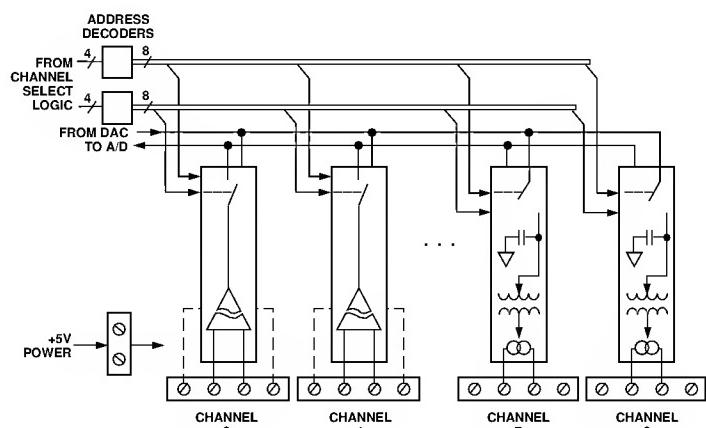


Figure 3. 5B08-MUX Functional Block Diagram

The I/O connectors provide a signal path for each channel and, in addition, a number of grounding pins are available to provide interchannel shield conductors in the ribbon cable. In some cases, discussed below, the ground conductors will not provide an accurate signal reference, so a SENSE pin is also provided in the connectors. Several jumper and component options on the 5B08 provide optimum ground connections for various applications.

### 5B08 OUTPUT CHANNEL SELECTION

To configure Model 5B08 I/O for different system needs, on-board jumpers are provided. A family of eight 3-pin jumpers, J8 through J15, allows the user to assign the 5B08 I/O to either the upper eight I/O pins (CH0, CH1, CH2, CH3, CH4, CH5, CH6, CH7) or to the lower eight I/O pins (CH8, CH9, CH10, CH11, CH12, CH13, CH14, CH15). This capability allows two 8-channel 5B08 backplanes to be used in a 16-channel configuration, with all I/O assigned to the 16 unique I/O pins, CH0–CH15. Table I illustrates the channel assignments for each of the eight jumpers, J8 through J15.

**Table I. 5B08 Output Channel Assignments**

Jumper	Jumper Position	Connects	To V/I Channel
J8	LO HI	Channel 0	0 8
J9	LO HI	Channel 1	1 9
J10	LO HI	Channel 2	2 10
J11	LO HI	Channel 3	3 11
J12	LO HI	Channel 4	4 12
J13	LO HI	Channel 5	5 13
J14	LO HI	Channel 6	6 14
J15	LO HI	Channel 7	7 15

### 5B08 INTERCHANNEL JUMPERS

The 5B08 offers the user the ability to easily connect the voltage output of any 5B Series input module directly to the voltage input of an adjacent output module (e.g., Model 5B39) by placing a jumper over two pins (J1, J2, J3, J4, J5, J6 or J7). This feature can be used to provide an isolated current output from an isolated input module. This results in both isolated voltage and isolated current outputs from a single sensor input signal. A kit of ten jumpers is available as Model AC1344.

Table II shows the channel assignments when Jumpers J1–J7 are used. Additional configuration flexibility is provided when the output jumper selections (J8–J15) are combined with the interchannel jumper selections (J1–J7). Table III provides the resulting signal assignments for each of the various jumper selections.

**Table II. 5B08 Interchannel Jumpers**

Jumper	Connects
J1	Channel 0 V <sub>OUT</sub> to Channel 1 V <sub>IN</sub>
J2	Channel 1 V <sub>OUT</sub> to Channel 2 V <sub>IN</sub>
J3	Channel 2 V <sub>OUT</sub> to Channel 3 V <sub>IN</sub>
J4	Channel 3 V <sub>OUT</sub> to Channel 4 V <sub>IN</sub>
J5	Channel 4 V <sub>OUT</sub> to Channel 5 V <sub>IN</sub>
J6	Channel 5 V <sub>OUT</sub> to Channel 6 V <sub>IN</sub>
J7	Channel 6 V <sub>OUT</sub> to Channel 7 V <sub>IN</sub>

**Table III. 5B08 Channel Assignments Using Output and Interchannel Jumpers**

Jumper Closed	Output Channel Jumper Setting	Connects	Connects V/I Channels	
J1	J8 LO J8 HI J8 LO J8 HI	J9 LO J9 LO J9 HI J9 HI	Channel 0 to Channel 1	0 to 1 8 to 1 0 to 9 8 to 9
J2	J9 LO J9 HI J9 LO J9 HI	J10 LO J10 LO J10 HI J10 HI	Channel 1 to Channel 2	1 to 2 9 to 2 1 to 10 9 to 10
J3	J10 LO J10 HI J10 LO J10 HI	J11 LO J11 LO J11 HI J11 HI	Channel 2 to Channel 3	2 to 3 10 to 3 2 to 11 10 to 11
J4	J11 LO J11 HI J11 LO J11 HI	J12 LO J12 LO J12 HI J12 HI	Channel 3 to Channel 4	3 to 4 11 to 4 3 to 12 11 to 12
J5	J12 LO J12 HI J12 LO J12 HI	J13 LO J13 LO J13 HI J13 HI	Channel 4 to Channel 5	4 to 5 12 to 5 4 to 13 12 to 13
J6	J13 HI J13 LO J13 HI J13 LO	J14 LO J14 LO J14 HI J14 HI	Channel 5 to Channel 6	5 to 6 13 to 6 5 to 14 13 to 14
J7	J14 HI J14 LO J14 HI J14 LO	J15 LO J15 LO J15 HI J15 HI	Channel 6 to Channel 7	6 to 7 14 to 7 6 to 15 14 to 15

# 5B08/5B08-MUX

## 5B08 GROUND JUMPERS

Model 5B08 is supplied with three grounding jumpers: W1, W3 and W4. These three jumpers are installed at the factory, but can be changed to accommodate user system configuration needs.

Jumper W1 connects the P1 and P2 shield pins (Pins 3, 6, 9, 12, 15, 18, 21 and 24) to the 5B08 I/O common (backplane measurement ground). This will usually be the primary ground connection between the 5B08 backplane and the measurement system. *This connection is required if output modules are used on the 5B08.* It is also required if there is no high impedance sense input (input LO of a differential or pseudo-differential system) available on the measurement system.

Jumper W3 connects the sense input, if available on Pin 25, to the 5B08 I/O common, so it can be read directly. W3 can be left in place at all times.

Jumper W4 connects the 5B08 I/O common to the +5 V power common. A connection between power common and I/O common is important for the 5B Series modules to function properly; however, if this connection is made elsewhere in your system (the best place is usually near the A/D or D/A converters), W4 should be cut since a ground loop could result.

## 5B08 ADDITIONAL INFORMATION

See the "5B08/5B08-MUX" sections of this data sheet for additional information on Model 5B08.

## 5B08-MUX DESCRIPTION

The 5B08-MUX incorporates input and output buses that take advantage of the internal series output switches in the 5B Series input modules as well as the track-and hold circuit in the output modules. Designers integrating the 5B08-MUX into a measurement and control system do not need external multiplexers and can use a single digital-to-analog converter to serve numerous output channels. Refer to Figure 3 for a functional block diagram and Figure 6 for a schematic diagram of model 5B08-MUX. Digital outputs from the host data acquisition system are used to address the 5B Series modules and designate inputs and outputs. Only one analog input, one analog output and a number of digital outputs are required to address up to 64 analog input/output channels using eight 5B08-MUX backplanes.

## MODEL 5B08-MUX SYSTEM CONNECTOR

Signal connections between the 5B08-MUX and the associated measurement or control system are made at P1, a 26-pin connector. The pinout of P1 is shown in Figure 4.

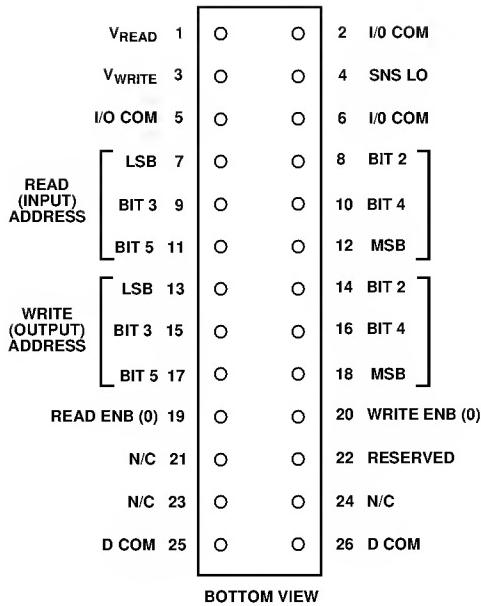


Figure 4. 5B08-MUX System Connector Pinout

One signal path is provided for inputs and one for outputs. Input and output modules are independently addressed by two sets of six address pins and an enable pin. In addition, a number of grounded pins are present in the connector pinout to provide shield conductors in the ribbon cable. In some cases, discussed below, the ground conductors will not provide an accurate signal reference, so a SENSE pin (SNS LO) is also provided in the pinout. Several jumper and component options in the backplane provide optimum ground connections for various circumstances.

## 5B08-MUX GROUND JUMPERS

Model 5B08-MUX is supplied with three grounding jumpers: W1, W2 and W4. These three jumpers are installed at the factory, but can be changed to accommodate user system configuration needs.

Jumper W1 connects the P1 shield pins (pins 2, 5 and 6) to the 5B08-MUX backplane common (backplane measurement ground). This will usually be the primary ground connection between the 5B08-MUX backplane and the measurement system. *This connection is required if output modules are used on the 5B08-MUX.* It is also required if there is no high impedance sense input (input LO of a differential or pseudo-differential system) available on the measurement system.

Jumper W2 connects the sense input from the measurement system, if available on pin 4, to the 5B08-MUX backplane common, so it can be read directly. W2 can be left in place at all times.

Jumper W4 connects the 5B08-MUX backplane common to the +5 V power common. A connection between power common and I/O common is important for the 5B Series modules to function properly; however, if this connection is made elsewhere in your system (the best place is usually near the A/D or D/A converters), W4 should be cut since a ground loop could result.

**5B08-MUX ADDRESS JUMPERS**

5B08-MUX backplane can hold eight 5B Series modules in any combination of inputs or outputs. Address decoders on the backplane determine which module is read (input type) or driven (output type). Separate decoders are provided for inputs and outputs. To permit system expansion, up to eight 5B08-MUX backplanes can be daisy-chained on the system I/O ribbon cable for a total of 64 channels. Jumpers on each backplane (labeled J1-J9 and J10-J18) determine the block of eight addresses assigned to each backplane. Input (read) and output (write) addressing are completely independent; in all cases, Jumpers J1-J9 control inputs and J10-J18 control outputs. Independent addressing might be used, for example, to update output modules without interrupting the monitoring of input modules.

**Table IV. 5B08-MUX Address Jumpers**

<b>Input Jumper</b>	<b>Output Jumper</b>	<b>Address Range</b>
J2	J11	56-63
J3	J12	48-55
J4	J13	40-47
J5	J14	32-39
J6	J15	24-31
J7	J16	16-23
J8	J17	8-15
J9	J18	0-7

**5B08-MUX FACTORY JUMPER SETTINGS**

5B08-MUX backplanes are factory configured with jumpers at positions J1 and J10. This sets up the 5B08-MUX backplane as a stand-alone 8-channel system. Moving the jumpers to any other position in the two blocks of jumpers enables decoding of the full six address bits; the exact position of the jumper determines address position for the 5B08-MUX backplane as shown in Table IV. To use multiple 5B08-MUX backplanes in this manner, connect the corresponding I/O connector pins of each backplane in parallel. Model CAB-01 cable is a ribbon cable with three 26-pin connectors designed for this purpose.

**5B08/5B08-MUX FUSING AND POLARITY REVERSAL**

Since reversing the polarity of the +5 V dc power source could destroy installed modules, the 5B08/5B08-MUX incorporate polarity reversal protection in the form of a shunt diode. A 4-ampere socketed fuse will open by the diode current if the supply is reversed. If the fuse is open, replacement with the proper type (Littelfuse\* Type 252 004) is essential.

**5B08/5B08-MUX GROUND STUDS**

The 5B Series modules meet transient voltage protection standard ANSI/IEEE C37.90.1-1989.

\*All trademarks are properties of their respective holders.

The 5B Series modules can prevent damage to the connected system even when a very large, fast transient strikes all eight field I/O lines at the same time. However, proper grounding of the backplane is essential to ensure full protection since, in such cases, currents on the order of an ampere, with rise times on the order of one microsecond, must be delivered to ground. Both the resistance and the inductance of the ground path are critical. In applications where hazards of this magnitude exist, the large (#10-32) ground stud provided at each end of the 5B08 backplane (at one end of the 5B08-MUX backplane) should be connected to system ground by the shortest practical length of large diameter wire.

The surge withstand capability can be tested with not less than fifty 2.5 kV bursts per second. A test duration of two seconds is widely accepted. A rise time of 20 kV/μs is specified and each module could see a surge current on the order of 1 ampere.

When a safety ground is used, the connection of backplane measurement ground to system measurement ground via the shield wires in the ribbon cable could result in a ground loop. If the application involves only input modules and a sense input is used on the measurement system, W1 should be cut to prevent a ground loop.

**5B08/5B08-MUX CAUTION**

W1 is required if output modules are used or there is no high impedance sense input on the measurement system. In these cases, the best defense against ground loop errors is to minimize the distance between the backplane and the associated system and to route any large currents carefully to minimize ground differences.

**5B08/5B08-MUX INPUT FIELD CONNECTIONS**

All field sensor and transducer connections to the 5B08 and 5B08-MUX are made to 4-screw terminal connectors associated with each channel. Figure 7 illustrates the specific field connections for each of the various 5B Series modules.

**5B SERIES MODULES**

The 5B Series provides a selection of over 14 module types, covering sensors signals such as mV, V, thermocouple, potentiometer, RTD, mA, frequency and strain. Both standard input/output ranges are available as well as custom ranges. The 5B-Custom program diskette, a Windows®-based program, is available from Analog Devices to assist the user both in selecting a standard module range and/or verifying if a custom range is available. Additionally, a 5B Series User manual is available to provide detailed specifications on all 5B Series modules and application information in using both modules and backplanes.

# 5B08/5B08-MUX

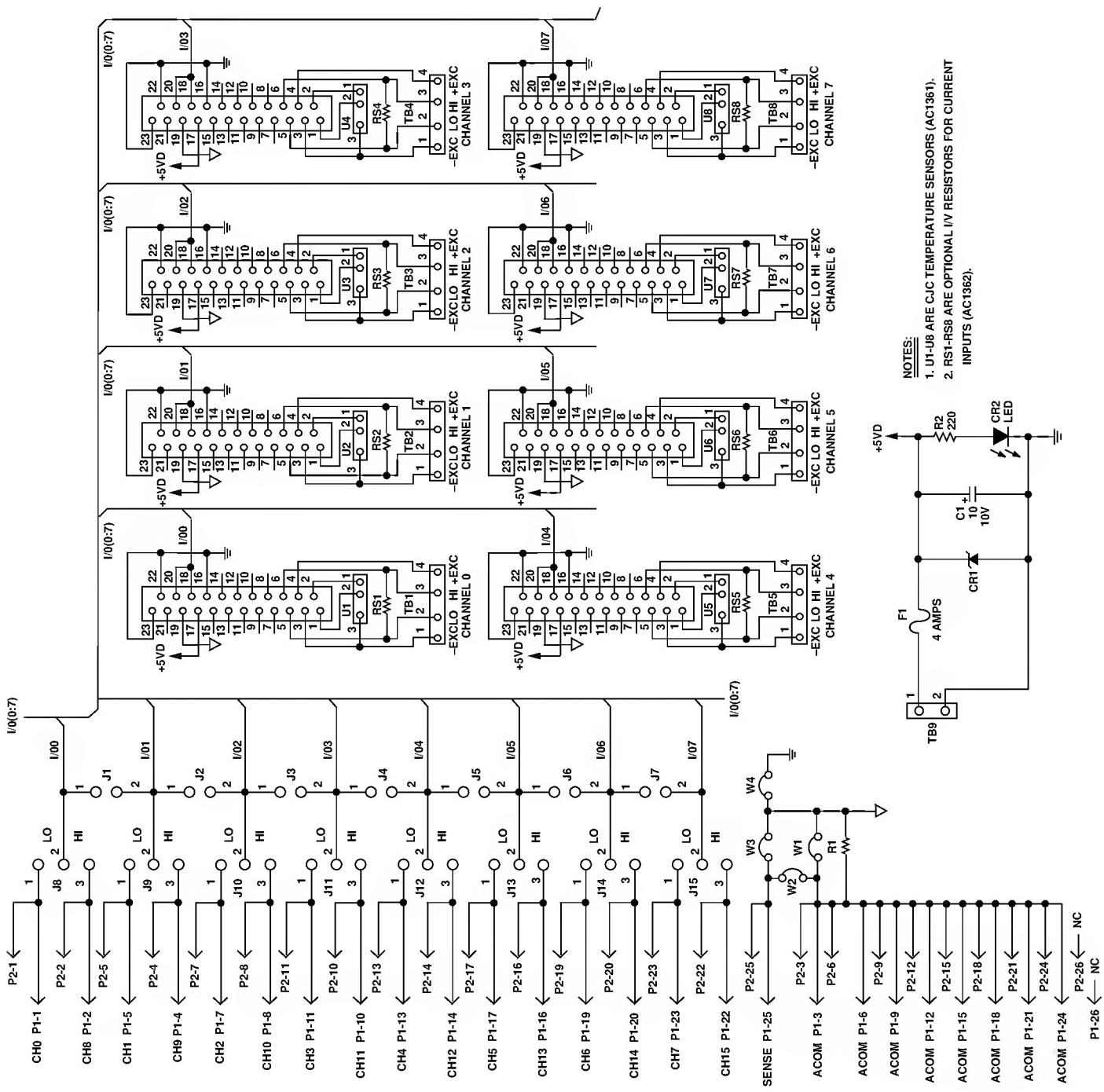
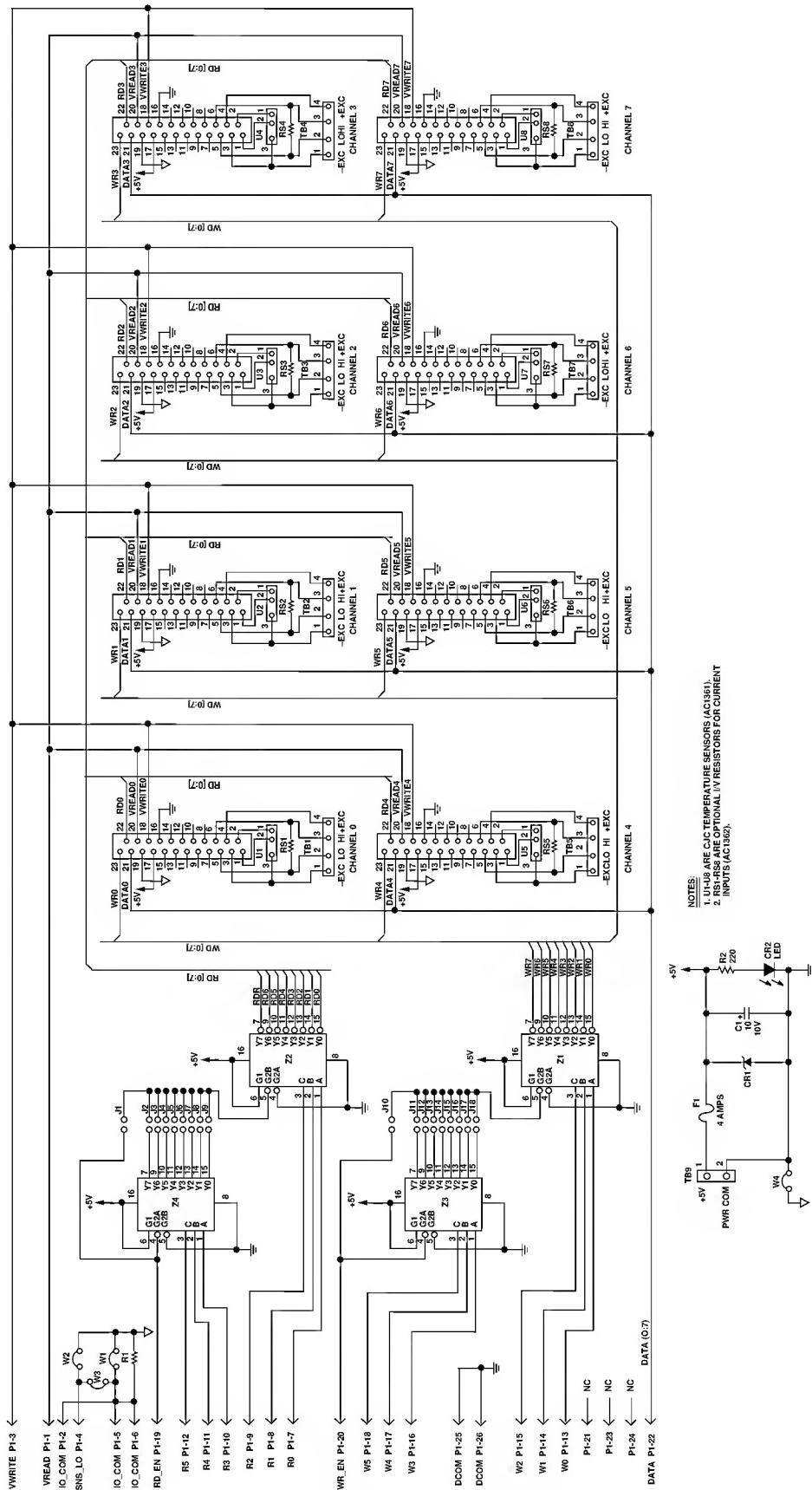


Figure 5. 5B08 Schematic Diagram



*Figure 6. 5B08-MUX Schematic Diagram*

# 5B08/5B08-MUX

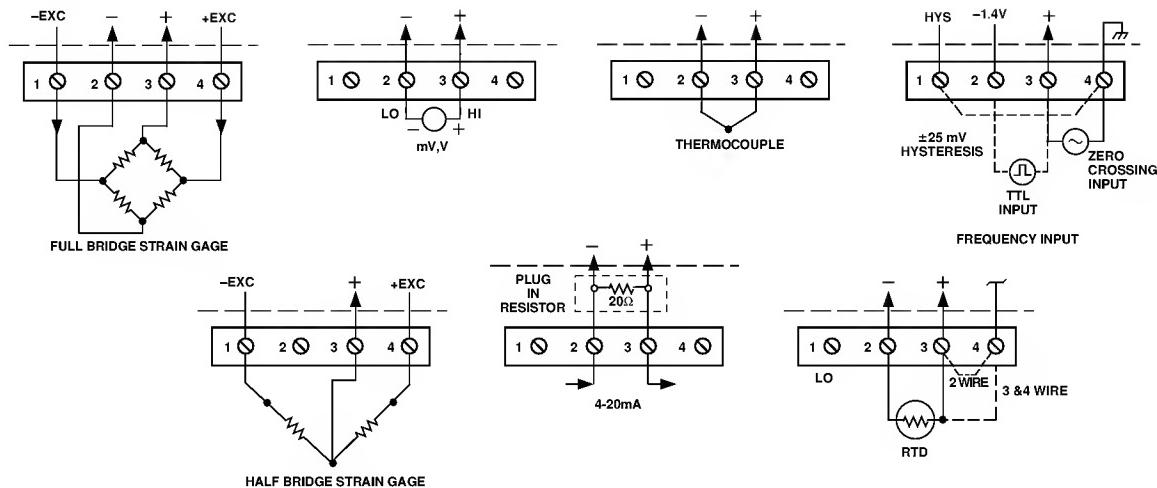


Figure 7. Field Input Connections

## OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

